Space Weather Technical Forecast

Issued on Monday, 04 July 2022 at 01:09 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Chance of isolated G1/Minor Storms associated with coronal hole 97.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been mostly Very Low, but increased to Low following a C3 flare at 03/1954UTC from AR3040, now rotated beyond view at the west limb.

There are currently three numbered sunspot regions on the visible disc. AR3046 remains the most significant of the three small and simple sunspot groups, located in the northeast quadrant. Some minor decay was observed in recent imagery in its small trailer spots, with the larger single lead spot unchanged.

No Earth-directed CMEs have been observed on available imagery.

Solar Wind / Geomagnetic Activity: The solar wind speed as observed at L1, has been at background levels, varying between 300-380km/s. Density was above average for much of the period, with a peak of 47ppcc at 03/0756 UTC, but has recently decreased erratically back to average levels. A steady increasing trend in the IMF back to moderate levels began around 03/0600 UTC with recent peak values near 15nT. The north-south component, Bz, was predominantly positive, with a peak of +10nT at 03/1143 UTC. Some recent short-lived negative periods gave a peak of -5nT. The above parameters may indicate some weak CME influence. The Phi angle has been mainly negative (away from the Sun), but showed a brief switch to the positive (towards the Sun) sector between around 03/0900-1200UTC. Geomagnetic activity was Quiet to Unsettled (Kp 2 to 3).

Energetic Particles / Solar Radiation: The high energy proton flux (10 MeV) as measured by GOES16 remained at background levels throughout the period. The high energy electron flux (greater than 2MeV) has been at mainly background levels through the last 24 hours. Electron fluence was well below the Active (1e8 integrated pfu) threshold. Observed fluence was 1.63e6 integrated pfu at 04/0000UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to be Low or Very Low, with a very slight chance of Moderate activity.

Solar Wind / Geomagnetic Activity: A possible slow CME from 29th may reach Earth on Day 2 (5th), however confidence is very low with no significant impacts currently anticipated. No other Earth directed CMEs are expected at present.

Solar winds are currently at background levels. The next main enhancement is likely to come from the northern CH97/+, which is a much larger and wider feature than on the previous rotation. There is some uncertainty on potential arrival time, but from later on Day (5th) is the

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current estimate. There is also a low chance of an enhancement at Earth prior to the anticipated CH97 from a previous smaller coronal hole in the southwest quadrant, but this is only low confidence.

Geomagnetic activity is likely to be mainly Quiet, with occasional Unsettled intervals possible through Day 1 and much of Day 2 (4th and 5th). An increased chance of Unsettled to Active periods is then likely to develop from later on Day 2 (5th), with a chance of isolated G1/Minor Storms, due to high speed stream arrival from coronal hole 97.

Energetic Particles / Solar Radiation: In the absence of any significant sunspot development, the high energy proton flux (greater than 10 MeV) is expected to remain at background levels. High energy electron flux (greater than 2MeV) is expected to be mainly moderate to background at first. However, there is a likely increasing chance of high (1e3 pfu) flux levels being reached during the forecast period due to anticipated high speed stream influence. Electron fluence is considered most likely to remain below the Active (1e8 integrated pfu) threshold, but with an anticipated rising trend.

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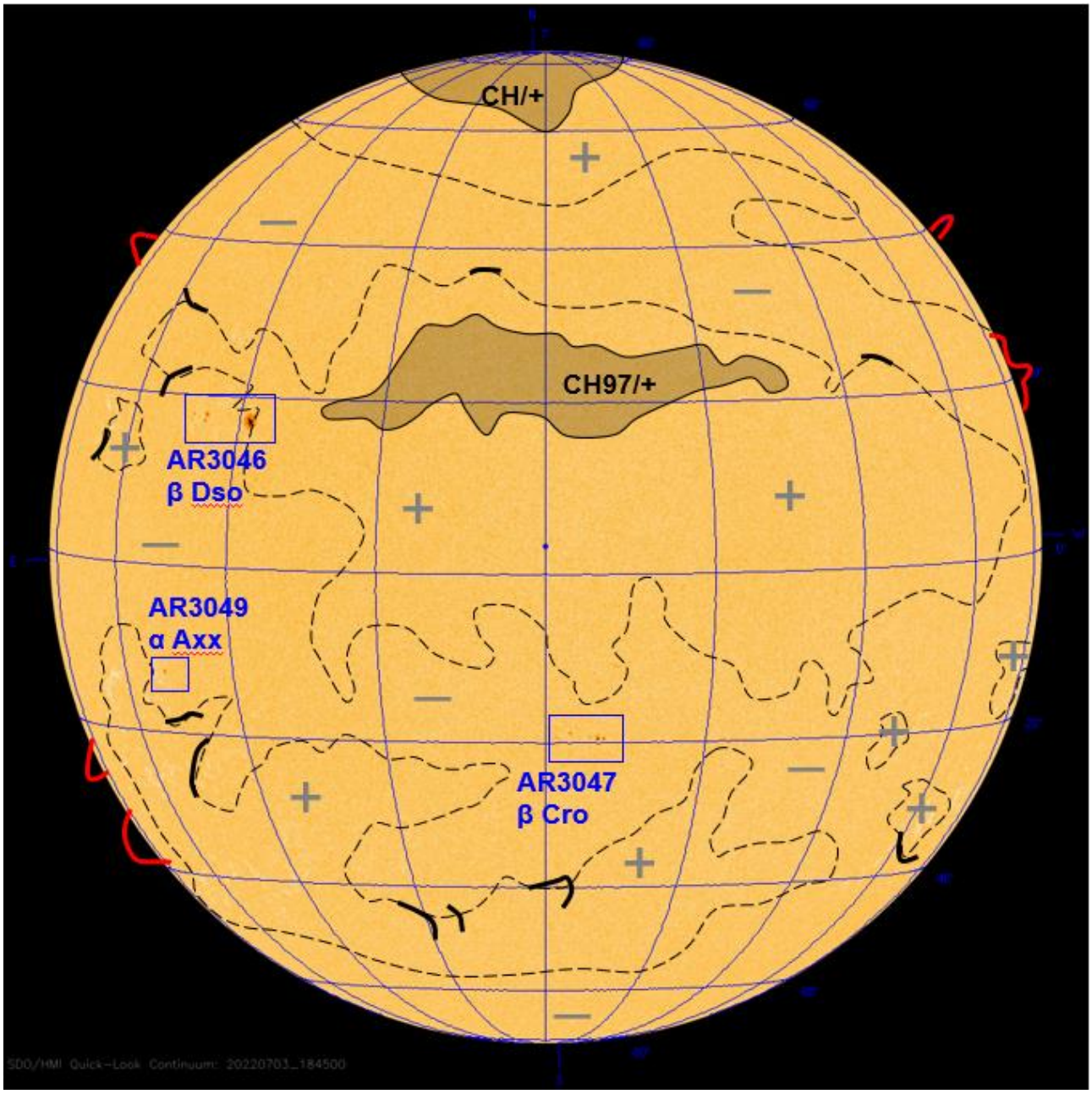
Figure 1. Solar Analysis Valid 03/1900 UTC.



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Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

A possible slow CME from 29th may reach Earth on Day 2 (5th), however confidence is very low with no significant impacts currently anticipated. No other Earth directed CMEs are expected at present.

Solar winds are currently at background levels. The next main enhancement is likely to come from the northern CH97/+, which is a much larger and wider feature than on the previous rotation. There is some uncertainty on potential arrival time, but from later on Day (5th) is the current estimate. A smaller coronal hole (96/-), previously analysed in the southwest quadrant has now become diffuse and dropped from the analysis. This may have interacted with STEREO-A on the 2nd giving an enhancement to solar wind parameters, however this is not certain. So there is chance of an enhancement at Earth prior to the anticipated CH97 connection, but this is only low confidence.

Geomagnetic activity is likely to be mainly Quiet, with occasional Unsettled intervals possible through Day 1 and much of Day 2 (4th and 5th). An increased chance of Unsettled to Active periods is then likely to develop from later on Day 2 (5th), with a chance of isolated G1/Minor Storms, due to high speed stream arrival from coronal hole 97.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	10	20	30	20
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

Date/time 21.5R (UTC)	Halo: Full or Partial	Source	Source Location	Estimated Speed	Estimated Arrival Time	Comments
29/1903	Partial	Filament	N18W0	200	5th	Very low confidence

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Met Office Space Weather Technical Forecast

Radio Blackouts - X-Ray Flares:

Solar activity has been mostly Very Low, but increased to Low following a C3 flare at 03/1954UTC from AR3040, now rotated beyond view at the west limb.
There are currently three numbered sunspot regions on the visible disc. AR3046 remains the most significant of the three small and simple sunspot groups, located in the northeast quadrant. Some minor decay was observed in recent imagery in its small trailer spots, with the larger single lead spot unchanged.

A couple of bright flux regions are apparent near the eastern limb of STEREO A EUVI imagery which may correspond to possible returning regions, and which are likely to rotate onto the Earth-facing disc during the period.

Solar activity is expected to be Very Low or Low through the next four days, with a very slight chance of Moderate activity.

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	5	5	5	5
Very Active	R3 to R5 X Class	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

The high energy proton flux (greater than 10 MeV) is currently at background levels, and will most likely remain at this level through the period, in the absence of any significant sunspot development.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	1	1	1	1
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

High Energy Electrons Event (≥ 2MeV):

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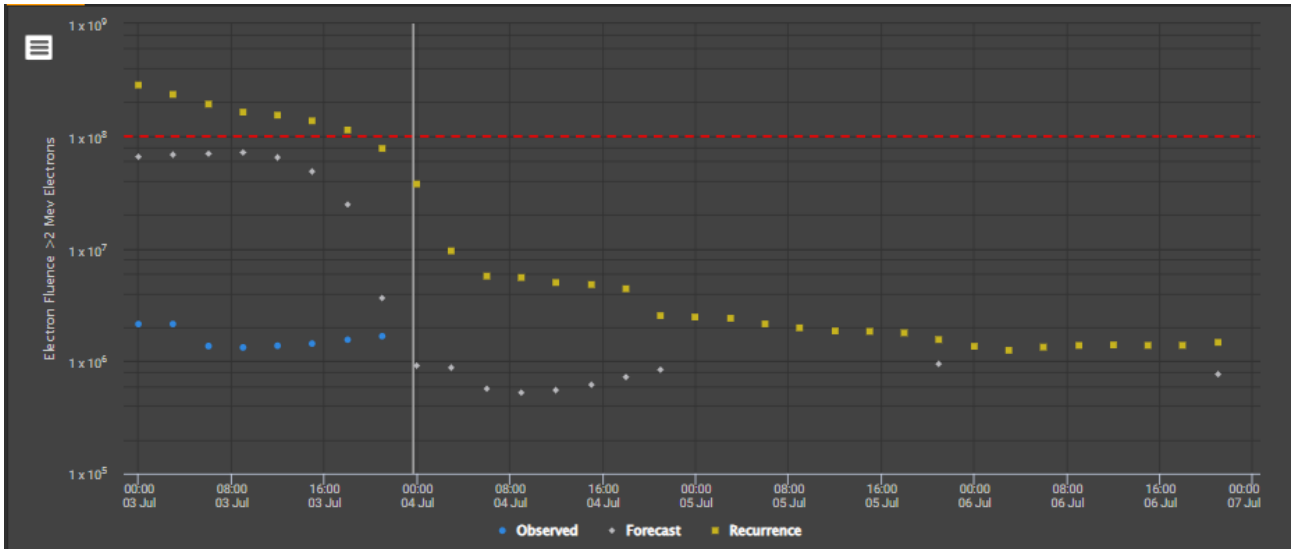
The high energy electron flux (greater than 2MeV) has been at mainly background levels. Electron flux is likely to oscillate between background and moderate levels, at least initially. However, there is a likely increasing chance of high (1e3 pfu) flux levels being reached during the forecast period due to anticipated high speed stream influence.

Electron fluence is currently well below the Active threshold. Fluence is currently considered most likely to remain below the Active threshold through the period, although this carries a degree of uncertainty due to the significant difference in coronal hole extent compared to the previous rotation. An upward trend is assessed as being likely following anticipated coronal hole connection but with low confidence for the magnitude of this. Recurrence is not considered to be a very good guide at present, and REFM maintains very low Fluence values, with no upward trend, which may be a little deficient.

GEO Electron Environment	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ 2 MeV ≥ $1x10^8$	No	5	10	20	30
Very Active	≥ 2 MeV ≥ $1x10^9$	No	1	1	1	5

Figure 2: MOSWOC REFM output.



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